US008980460B2

(12) **United States Patent**
Zhang et al.

(10) **Patent No.: US 8,980,460 B2**
(45) **Date of Patent: *Mar. 17, 2015**

(54) **METHODS AND ELECTROLYTES FOR ELECTRODEPOSITION OF SMOOTH FILMS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 14 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/495,727**

(22) Filed: **Jun. 13, 2012**

(65) **Prior Publication Data**

US 2013/0199936 A1 Aug. 8, 2013

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/367,508, filed on Feb. 7, 2012.

(51) **Int. Cl.**

H01M 4/04	(2006.01)
C09D 5/44	(2006.01)
C25D 3/02	(2006.01)
C25D 3/12	(2006.01)
C25D 3/20	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC ***C25D 3/02*** (2013.01); ***C09D 5/4484*** (2013.01); ***C25D 3/12*** (2013.01); ***C25D 3/20*** (2013.01); ***C25D 3/22*** (2013.01); ***C25D 3/30*** (2013.01); ***C25D 3/38*** (2013.01); ***C25D 3/42*** (2013.01); ***C25D 3/46*** (2013.01); ***C25D 3/48*** (2013.01); ***C25D 3/50*** (2013.01); ***C25D 5/00*** (2013.01); ***C25D 13/22*** (2013.01)

USPC **429/137**; 429/188; 429/50

(58) **Field of Classification Search**

USPC 429/50, 188, 137

See application file for complete search history.

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(57) **ABSTRACT**

Electrodeposition involving an electrolyte having a surface-smoothing additive can result in self-healing, instead of self-amplification, of initial protuberant tips that give rise to roughness and/or dendrite formation on the substrate and/or film surface. For electrodeposition of a first conductive material (C1) on a substrate from one or more reactants in an electrolyte solution, the electrolyte solution is characterized by a surface-smoothing additive containing cations of a second conductive material (C2), wherein cations of C2 have an effective electrochemical reduction potential in the solution lower than that of the reactants.

19 Claims, 5 Drawing Sheets